PATENT ABSTRACTS OF JAPAN

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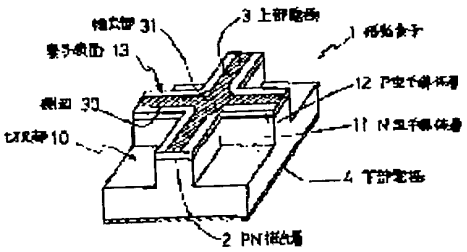
(54) LIGHT EMITTING DEVICE

(57)Abstract:
PURPOSE: To provide an upper part electrode and device structure capable of enhancing higher brightness in the same chip size.
CONSTITUTION: A cross type and belt-shaped upper part electrode 3 is formed on the surface of a light emitting device 1. A notched portion 10 is installed by vertically eliminating a part of the light emitting device 1 along the side 30 of the upper part electrode 3 from the surface. A PN junction layer 2 is exposed at the notched portion 10. Since it is possible to fetch the light generated on the PN junction layer 2 under the electrode without self absorption, higher brightness will be available for the light emitting device.



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CLAIMS

[Claim(s)]
[Claim 1] The light emitting device characterized by having formed the band-like up electrode in the front face of a light emitting device, having had the notch by which a part of light emitting device was perpendicularly removed from the front face along the side side of this band-like up electrode, and the PN-junction layer having expressed in this notch.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to amelioration of the component structure which can raise the brightness of a light emitting device.
[0002]
[Description of the Prior Art] The example of the structure of the conventional general light emitting device 51 is shown in drawing 5 . An N-type semiconductor layer and 12 show a P-type semiconductor layer, 2 shows the PN-junction layer, respectively, and, as for 11, the lower electrode 4 plate-like in the up dot-like electrode 30 is formed in the front-face side center section of this component 51 at the rear-face side. However, it was a big obstruction with this problem for [an obstruction / while the light produced in the PN-junction layer 2 directly under / up electrode 30 /, i.e., near a component center section, is emitted very much to an end face with this component structure, the problem that a self-absorption is carried out to the component itself is, and] attaining high brightness-ization of a light emitting device.
[0003] Then, the structure of a light emitting device 50 like drawing 4 is proposed in order to aim at improvement in brightness. This component 50 removes partially the semiconductor material of the perpendicular lower part of dot-like up electrode 30 periphery by etching etc., and processes it in the shape of [in which the PN-junction layer 2 exists on the way] a cylinder. Comparatively strong light which will be produced in the PN-junction layer 2 of up electrode 30 directly under if it is this component structure (under the effect of current diffusibility, luminescence of electrode 30 directly under is strong compared with the component edge section far from an electrode 30.) This inclination becomes remarkable when lamination of this layer is carried out that the self-absorption of the light by the P-type semiconductor layer 12 should be controlled. There is an advantage of the above-mentioned self-absorption that it can take out without a failure from an end face.
[0004]
[Problem(s) to be Solved by the Invention] However, with the structure of the component 50 as shown in above-mentioned drawing 4 , in order to remove the circumference of the dot-like up electrode 30, there was little expressional area of PN-junction layer 2 end face, and it found out that there was a limitation in high brightness-ization. Therefore, this invention makes it a technical problem to offer the up electrode and component structure where high brightness-ization can be attained more in the same chip size.
[0005]
[Means for Solving the Problem] A band-like up electrode is formed in the front face of a light emitting device, and the light emitting device of this invention which solves the above-mentioned technical problem has the notch by which a part of light emitting device was perpendicularly removed from the front face along the side side of this band-like up electrode, and is characterized by the PN-junction layer having expressed in this notch.

[0006]
[Function] Since the up electrode was replaced with the conventional dot-like electrode, it considered as the band electrode and it considered as the configuration which prepared the notch which the PN-junction section moreover expresses along the side side of this band electrode, expressional area of the PN-junction layer which exists directly under an up electrode can be enlarged compared with a dot-like electrode type as shown in drawing 4 . Therefore, since many parts to which the expressional area of the PN-junction section increased, and have [no self-absorption] more much comparatively powerful light generated directly under the electrode can be taken out, the luminescence brightness of a component can be raised.
[0007]
[Example] The example of this invention is explained to a detail, referring to a drawing below. Drawing 1 is the perspective view showing the light emitting device 1 concerning this invention. In drawing, 11 and 12 are the N-type semiconductor layers and P-type semiconductor layers which consist of a GaInP epitaxial growth phase etc., respectively, both joint is used as the PN-junction layer 2, the up electrode 3 is put on the front-face 13

side of this component 1, and the lower electrode 4 is put on the rear-face side, respectively.
[0008] The above-mentioned up electrode 3 is presenting the cross-joint mold which two band electrodes crossed, the notch 10 from which a part of component 1 was removed by perpendicular down along the side side 30 of this band-like up electrode 3 is formed, and this light emitting device 1 is presenting as a result the configuration by which the management four corners were removed in the shape of a rectangle. The notch 10 is formed ranging over the upper P-type semiconductor layer 12 and the lower layer upper N-type semiconductor layer 11, and the PN-junction layer 2 has expressed it in this notch 10.
[0009] About 5-40-micrometer about 15-30 micrometers are preferably suitable for the width of face of the up electrode 3 formed in band-like. If width of face is too thin, while the activity at the time of being electrode formation is difficult, there is an inclination for a current to stop being able to flow easily. Conversely, when width of face is too thick, while the light generated in the PN-junction layer 2 directly under a center section of the electrode 3 cross direction results in an end face, the inclination which the degree by which a self-absorption is carried out increases is. In addition, although this example shows the example which gave some width of face between the periphery on the front face 13 of a component, and the up electrode 3, the up electrode 3 may be formed, without preparing width of face so that the component surface 13 whole surface may be covered.
[0010] What is necessary is just to form the above-mentioned notch 10 so that the PN-junction layer 2 of directly under [of the up electrode 3 / side side 30] or its near may express along the side side 30 at least. By considering as this structure, the light produced in the PN-junction layer 2 of up electrode 3 directly under can be positively taken out without a self-absorption, and brightness can be raised. Although the depth of a notch 10 is arbitrary, when the thickness of the P-type semiconductor layer 12 is [the thickness of 5 micrometers and the N-type semiconductor layer 11] 20 micrometers, for example, about 10 micrometers is suitable for the depth of the perpendicular direction of a notch 10 from the component front face 13.
[0011] The formation approach of a notch 10 can adopt the removal method by well-known etching processing as it is for example, conventionally, and formation stages may be any before formation of the up electrode 3, and after formation. In addition, although the notch 10 removed from the component front face 13 right under right under [perpendicular] is illustrated in this example, as long as it has expressed even the PN-junction layer 2 along the electrode side side 30, notch 10 pars basilaris ossis occipitalis may become Susono-like.
[0012] The formation approach of the up electrode 3 on the front face 13 of a component is arbitrary, and can adopt various well-known approaches conventionally. If the adhesion of an electrode shows as an example the example of the desirable formation approach whose component front face 13 is not well ruined, electrode materials, such as Au, AuBe, AuZn, and aluminum, will be first vapor-deposited on the component front face 13, then, the mask of the front face of an electrode formation part will be carried out in a photoresist, and electrode patterning will be performed. And it etches, finally annealing treatment is performed in an inert gas ambient atmosphere with a resistance heating furnace or an infrared heating furnace, and the desired up electrode 3 is obtained.
[0013] Usually, the bonding wire for electric supply is attached in the up electrode 3. In this invention, the up electrode 3 is beltlike, and as there is an inclination for attachment of a bonding wire to become difficult since it is narrow, and shown in drawing 1 for this reason, it is desirable to form the electrode broad section 31 for bonding wire attachment in some up electrodes 3.
[0014] In this invention, the configuration of the light emitting device itself is arbitrary, for example, what used various P type, such as InP, GaAs, GaP, AlGaAs, and GaInP, and an N-type semiconductor ingredient can apply it broadly. Above all, a GaInP gay assembling-die light emitting device etc. is suitable.
[0015] Drawing 2 is the top view showing other examples of the light emitting device concerning this invention. In this example, the up electrode 3 is formed in a T character mold with a band electrode, a semiconductor material is removed along that side side 30, and a notch 10 is formed.
[0016] It is the top view of other examples of this invention, and by this example, drawing 3 also arranges a band electrode in the center section on the front face 13 of a component, and shows the example of the up electrode 3 which comes to add a band electrode to the both ends at a relative direction further. The notch 10 is formed along the side side 30 of this up electrode 3 like the above. As for the component front face 13 and the PN-junction layer [directly under] of it which were removed by the configuration and notch 10 of the up electrode 3, like these examples, it is desirable to carry out abbreviation coincidence.
[0017] Various configurations of the up electrode 3 can be changed besides the above-mentioned example, for example, a H character mold, a RO character type, a L character mold, an easy mold, etc. are mentioned. The configuration where it is desirable in this is a configuration which does not have a failure in the luminescence direction of the PN-junction layer 2 expressed to that end face by the notch 10. That is, the configuration in which the part which PN-junction layer 2 comrades expressing an end face will counter if the up electrode 3 and a notch 10 are formed in a H character mold etc. exists, and the opposite section of end faces as the self-absorption of the light emitted from one end face carried out in an other-end side, and there is an inclination for

brightness to fall a little and shown in drawing 1 - drawing 3 for this reason does not exist is desirable.
[0018] The vertical x horizontal x height =350micrometerx350micrometerx200micrometer light emitting device chip which has the PN-junction layer 2 which consists of an N-type semiconductor layer 11 with a thickness of 20 micrometers it is thin from the epitaxial growth phase of GaInP on an example 1 semi-conductor substrate, respectively, and a P-type semiconductor layer 12 with a thickness of 6 micrometers was created. The up electrode 3 which consists of a cross band electrode with an electrode width of face of 30 micrometers the electrode material which consists of AuBe by the approach of performing patterning and annealing treatment after vacuum deposition was formed in the front face 13 of this light emitting device chip. And it etched into the component front face 13 except for up electrode 3 part, the notch 10 with a depth of 12 micrometers was formed, and the light emitting device 1 as shown in drawing 1 was obtained. In addition, the circular broad section 31 with a diameter of 50 micrometers was formed in the cross section of the upper electrode 3. Moreover, the lower electrode 4 which consists of AuSn was put on the rear face of a chip.
[0019] Wirebonding was given in the broad section 31 of the up electrode 3, the 20mA current was added between this wire and the lower electrode 4, and the light emitting device 1 was made to emit light to the light emitting device 1 obtained above. The brightness at this time was measured with the measurement-of-luminance plan (EG&G photometer model 550-1).
[0020] For the light emitting device chip created in the example 2 above-mentioned example 1, the light emitting device as shown by the same approach as the above-mentioned example 1 at drawing 2 was created except having used the configuration of the up electrode 30 as the T character mold. And brightness was measured like the above.
[0021] The light emitting device was created by the same approach as the above-mentioned example 1 except having considered as the configuration as shows the configuration of the up electrode 30 to the light emitting device chip created in the example 3 above-mentioned example 1 at drawing 3 . And brightness was measured like the above.
[0022] The light emitting device 50 while forming the dot-like up electrode 30 with a diameter of 120 micrometers in the light emitting device chip created in the example of comparison 1 above-mentioned example 1 by the same approach as the above, as removed the surrounding semiconductor material of this electrode 30 for it by etching (a removal depth of 20 micrometers) and shown in it at drawing 4 was obtained. And brightness was measured like the above.
[0023] The dot-like up electrode 30 with a diameter of 120 micrometers was formed in the light emitting device chip created in the example of comparison 2 above-mentioned example 1 by the same approach as the above, and the light emitting device 51 as shown at drawing 5 was obtained. And brightness was measured like the above.
[0024] The measurement-of-luminance result using the integrating sphere of the light emitting device created in the above-mentioned examples 1-3 and the examples 1 and 2 of a comparison is shown in Table 1.
[0025]
[Table 1]

	実施例1	実施例2	実施例3	比較例1	比較例2
チップ輝度 (mcd)	10.2	10.0	10.5	6.0	3.3

[0026] It was checked the passage clear from Table 1 that brightness of brightness of the light emitting device of the examples 1-3 which adopted the component structure concerning this invention had improved sharply compared with the example article of a comparison which is structure conventionally.
[0027]
[Effect of the Invention] Since it considered as the configuration which forms an up electrode with a band electrode and the PN-junction layer directly under this band electrode expresses according to the light emitting device of this invention as explained above, the expressional area of the PN-junction layer which can take out light without a self-absorption increases. Therefore, since the ejection effectiveness of the light in the same chip size can be raised, high brightness-ization of a light emitting device can be attained.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the perspective view showing the structure of the light emitting device concerning this invention.
[Drawing 2] It is the top view showing other examples of this invention.
[Drawing 3] It is the top view showing other examples of this invention.
[Drawing 4] It is the perspective view showing the structure of the conventional light emitting device.
[Drawing 5] It is the perspective view showing the structure of the conventional light emitting device.
[Description of Notations]
1 Light Emitting Device
10 Notch
11 N-type Semiconductor Layer
12 P-type Semiconductor Layer
13 Component Front Face
2 PN-Junction Layer
3 Up Electrode
30 Side Side
31 Broad Section

[Translation done.]

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審査請求　未請求　請求項の数１(全　４　頁)

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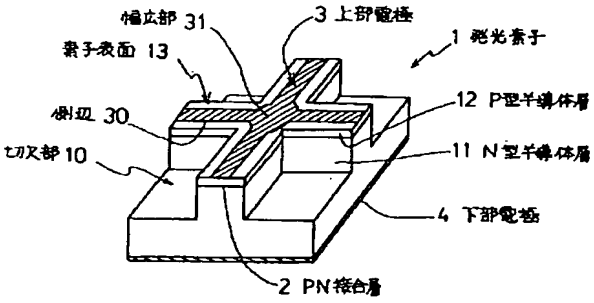
(54)【発明の名称】　発光素子

(57)【要約】
【目的】　同一チップサイズにおいてより高輝度化を図り得る上部電極及び素子構造を提供すること。
【構成】　発光素子１の表面に十字型の帯状上部電極３が形成され、該上部電極３の側辺３０に沿って発光素子の一部を表面から垂直方向に除去した切欠部１０を設け、該切欠部１０においてＰＮ接合層２を表出させてなる。電極直下のＰＮ接合層２で生じた光を自己吸収なしに取り出せるので、発光素子の高輝度化が図れる。



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【特許請求の範囲】

【請求項１】　発光素子の表面に帯状の上部電極が形成され、該帯状上部電極の側辺に沿って発光素子の一部が表面から垂直方向に除去された切欠部を有し、該切欠部においてＰＮ接合層が表出していることを特徴とする発光素子。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、発光素子の輝度を向上させることができる素子構造の改良に関するものである。

【０００２】

【従来の技術】従来の一般的な発光素子５１の構造の例を図５に示す。１１はＮ型半導体層、１２はＰ型半導体層、２はＰＮ接合層をそれぞれ示しており、該素子５１の表面側中央部にはドット状の上部電極３０が、裏面側には平板状の下部電極４が設けられている。しかしながら該素子構造では、上部電極３０直下、すなわち素子中央部付近のＰＮ接合層２で生じた光が端面に至って放射される間に素子自体に自己吸収されるという問題があり、かかる問題が発光素子の高輝度化を図るに際しての大きな障壁であった。

【０００３】そこで輝度向上を図るべく図４のような発光素子５０の構造が提案されている。該素子５０はドット状上部電極３０周辺部の垂直下方の半導体材料をエッチング等で部分的に除去し、途中にＰＮ接合層２が存在する円柱状に加工したものである。かかる素子構造であれば、上部電極３０直下のＰＮ接合層２で生ずる比較的強い光（電流拡散性の影響で、電極３０から遠い素子端縁部に比べ電極３０直下の発光は強い。この傾向はＰ型半導体層１２による光の自己吸収を抑制すべく該層を薄層化した場合顕著となる。）が、上記自己吸収という障害なしに端面方向から取り出せるという利点がある。

【０００４】

【発明が解決しようとする課題】しかしながら上記図４に示すような素子５０の構造では、ドット状上部電極３０の周辺を除去してしまうためＰＮ接合層２端面の表出面積が少なく、高輝度化には限界があることを見出した。従って本発明は、同一チップサイズにおいてより高輝度化を図り得る上部電極及び素子構造を提供することを課題とする。

【０００５】

【課題を解決するための手段】上記課題を解決する本発明の発光素子は、発光素子の表面に帯状の上部電極が形成され、該帯状上部電極の側辺に沿って発光素子の一部が表面から垂直方向に除去された切欠部を有し、該切欠部においてＰＮ接合層が表出していることを特徴とするものである。

【０００６】

【作用】上部電極を、従来のドット状電極に代えて帯状電極とし、しかも該帯状電極の側辺に沿ってＰＮ接合部が表出する切欠部を設けた構成としたので、上部電極直下に存在するＰＮ接合層の表出面積を、図４に示すようなドット状電極タイプに比べ大きくすることができる。従ってＰＮ接合部の表出面積が増大した分、電極直下で発生した比較的強力な光を自己吸収なしにより多く取り出せるので、素子の発光輝度を向上させることができる。

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【０００７】

【実施例】以下図面を参照しながら本発明の実施例を詳細に説明する。図１は本発明にかかる発光素子１を示す斜視図である。図において、１１，１２はそれぞれＧａＩｎＰエピタキシャル成長層等からなるＮ型半導体層、Ｐ型半導体層であり、両者の接合部はＰＮ接合層２とされ、該素子１の表面１３側には上部電極３が、裏面側には下部電極４がそれぞれ被着されている。

【０００８】上記上部電極３は、２本の帯状電極がクロスした十字型を呈しており、該帯状上部電極３の側辺３０に沿って垂直下方向に素子１の一部が除去された切欠部１０が設けられ、結果として該発光素子１は、その上層部四隅が方形状に取り除かれた形状を呈している。切欠部１０は、上層のＰ型半導体層１２及び下層のＮ型半導体層１１にまたがって設けられており、該切欠部１０においてＰＮ接合層２が表出している。

【０００９】帯状に形成する上部電極３の幅は５～４０μｍ程度、好ましくは１５～３０μｍ程度が適当である。幅が細すぎると電極形成の際の作業が困難であると共に電流が流れにくくなる傾向がある。逆に幅が太すぎると、電極３幅方向の中央部直下のＰＮ接合層２で発生した光が、端面に至る間に自己吸収される度合が増加してしまう傾向がある。なお本実施例では、素子表面１３の周縁と上部電極３との間に若干の幅を持たせた例を示しているが、幅を設けることなく素子表面１３全面を覆うように上部電極３を設けても良い。

【００１０】上記切欠部１０は、少なくとも上部電極３の側辺３０直下或いはその近傍のＰＮ接合層２が側辺３０に沿って表出するよう設ければ良い。かかる構造とすることにより、上部電極３直下のＰＮ接合層２で生じた光を自己吸収なしに積極的に取り出す事ができ、輝度を向上させることができる。切欠部１０の深さは任意であるが、例えばＰ型半導体層１２の厚さが５μｍ、Ｎ型半導体層１１の厚さが２０μｍである場合、切欠部１０の垂直方向の深さは素子表面１３から１０μｍ程度が適当である。

【００１１】切欠部１０の形成方法は、例えば従来公知のエッチング処理による除去法をそのまま採用することができ、また形成時期は上部電極３の形成前、或いは形成後のいずれであっても良い。なお本実施例では、素子表面１３から垂直真下に除去した切欠部１０を例示しているが、ＰＮ接合層２さえ電極側辺３０に沿って表出し

ていれば切欠部１０底部は裾野状になっていても良い。

【００１２】素子表面１３への上部電極３の形成方法は任意であり、従来公知の各種方法が採用できる。一例として、電極の密着性が良く素子表面１３が荒れない好ましい形成方法の例を示すと、まず素子表面１３上にＡｕ，ＡｕＢｅ，ＡｕＺｎ，Ａｌ等の電極材料を蒸着し、次に電極形成部分の表面をフォトレジストにてマスクし電極パターニングを施す。そしてエッチングを行い、最後に抵抗加熱炉や赤外線加熱炉にて不活性ガス雰囲気中でアニール処理を施し、所望の上部電極３を得るものである。

【００１３】通常上部電極３には、給電用のボンディングワイヤが取着される。本発明において、上部電極３は帯状で幅狭であるのでボンディングワイヤの取付作業が困難になる傾向があり、このため図１に示すように、上部電極３の一部にボンディングワイヤ取着用の電極幅広部３１を設けることが望ましい。

【００１４】本発明において、発光素子自体の構成は任意であり、例えばＩｎＰ，ＧａＡｓ，ＧａＰ，ＡｌＧａＡｓ，ＧａＩｎＰ等の各種Ｐ型、Ｎ型半導体材料を使用したものが幅広く適用できる。就中、ＧａＩｎＰホモ接合型発光素子などが好適である。

【００１５】図２は本発明にかかる発光素子の他の例を示す平面図である。この実施例では、上部電極３を帯状電極によってＴ字型に形成し、その側辺３０に沿って半導体材料を取り除いて切欠部１０を設けたものである。

【００１６】図３も本発明の他の実施例の平面図であり、本例では素子表面１３の中央部に帯状電極を配置し、さらにその両端に相対方向に帯状電極を付加してなる上部電極３の例を示している。上記と同様に該上部電極３の側辺３０に沿って切欠部１０が設けられている。これら実施例のように、上部電極３の形状と切欠部１０によって除去された素子表面１３及びその直下のＰＮ接合層とは、略一致させておくことが好ましい。

【００１７】上記実施例以外にも上部電極３の形状は種々変更可能であり、例えばＨ字型、ロ字型、Ｌ字型、Ｅ字型等が挙げられる。この中で好ましい形状は、切欠部１０によってその端面に表出したＰＮ接合層２の発光方向に障害がない形状である。すなわち、Ｈ字型等に上部電極３及び切欠部１０を設けると、端面に表出したＰＮ接合層２同士が対向する部分が存在し、一方の端面から放出された光が他方の端面において自己吸収され、若干輝度が低下する傾向があり、このため図１～図３に示すような端面同士の対向部が存在しない形状が望ましい。

【００１８】実施例１

半導体基板上にそれぞれＧａＩｎＰのエピタキシャル成長層からなる厚さ２０μｍのＮ型半導体層１１と、厚さ６μｍのＰ型半導体層１２とから構成されるＰＮ接合層２を有する、縦×横×高さ＝３５０μｍ×３５０μｍ×２００μｍの発光素子チップを作成した。該発光素子チップの表面１３に、ＡｕＢｅからなる電極材料を真空蒸着後にパターニング及びアニール処理を施す方法で、電極幅３０μｍの十字型帯状電極からなる上部電極３を形成した。そして上部電極３部分を除いて素子表面１３にエッチングを施して深さ１２μｍの切欠部１０を形成し、図１に示すような発光素子１を得た。なお上電極３のクロス部には、直径５０μｍの円形幅広部３１を設けた。またチップの裏面にはＡｕＳｎからなる下部電極４を被着した。

【００１９】上記で得た発光素子１に、上部電極３の幅広部３１においてワイヤボンディングを施し、該ワイヤと下部電極４との間に２０ｍＡの電流を加え、発光素子１を発光させた。このときの輝度を輝度測定計（ＥＧ＆Ｇ社フォトメーター　モデル５５０－１）にて測定した。

【００２０】実施例２

上記実施例１で作成した発光素子チップに、上部電極３０の形状をＴ字型とした以外は、上記実施例１と同様の方法で図２に示すような発光素子を作成した。そして上記と同様にして輝度を測定した。

【００２１】実施例３

上記実施例１で作成した発光素子チップに、上部電極３０の形状を図３に示すような形状とした以外は上記実施例１と同様の方法で発光素子を作成した。そして上記と同様にして輝度を測定した。

【００２２】比較例１

上記実施例１で作成した発光素子チップに、上記と同様の方法により直径１２０μｍのドット状上部電極３０を形成すると共に、該電極３０の周辺の半導体材料をエッチングで除去（除去深さ２０μｍ）して図４に示すような発光素子５０を得た。そして上記と同様にして輝度を測定した。

【００２３】比較例２

上記実施例１で作成した発光素子チップに、上記と同様の方法により直径１２０μｍのドット状上部電極３０を形成し、図５に示すような発光素子５１を得た。そして上記と同様にして輝度を測定した。

【００２４】上記実施例１～３及び比較例１，２で作成した発光素子の積分球を用いた輝度測定結果を表１に示す。

【００２５】

【表１】

	実施例１	実施例２	実施例３	比較例１	比較例２
チップ輝度（ｍｃｄ）	１０．２	１０．０	１０．５	６．０	３．３

【００２６】表１から明らかな通り、本発明にかかる素子構造を採用した実施例１～３の発光素子の輝度は、従来構造である比較例品に比べ、輝度が大幅に向上したことが確認された。

【００２７】

【発明の効果】以上説明した通りの本発明の発光素子によれば、上部電極を帯状電極にて形成し、該帯状電極直下のＰＮ接合層が表出する構成としたので、自己吸収なしに光を取り出せるＰＮ接合層の表出面積が増大する。従って同一チップサイズでの光の取り出し効率を向上させることができるので、発光素子の高輝度化を図ることができる。

【図面の簡単な説明】

【図１】本発明にかかる発光素子の構造を示す斜視図である。

＊【図２】本発明の他の実施例を示す平面図である。

【図３】本発明の他の実施例を示す平面図である。

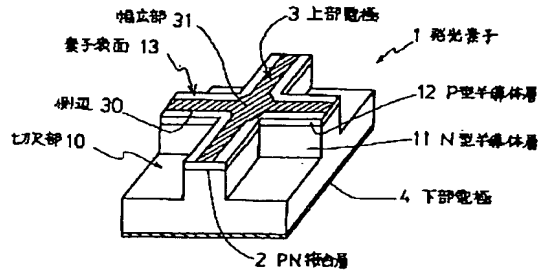
【図４】従来の発光素子の構造を示す斜視図である。

【図５】従来の発光素子の構造を示す斜視図である。

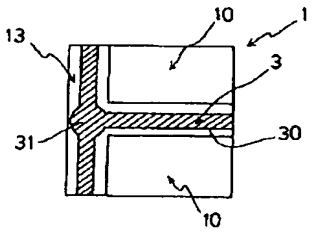
【符号の説明】

１	発光素子
１０	切欠部
１１	Ｎ型半導体層
１２	Ｐ型半導体層
１３	素子表面
２	ＰＮ接合層
３	上部電極
３０	側辺
３１	幅広部

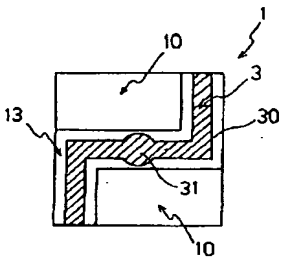
【図１】



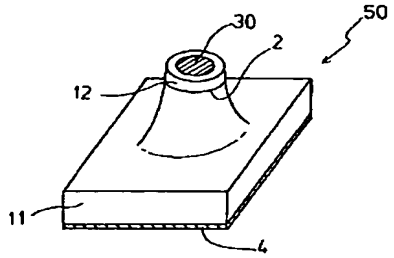
【図２】



【図３】



【図４】



【図５】